



# FEMS App Time-of-Use Tariff

Version:2025.5.1

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## 1. Introduction

### 1. Introduction

Dear customer,

Thank you for choosing the "FEMS App Time-of-Use Tariff". You are welcome to send us your suggestions so that we can further improve the quality of our products.

### 2. Installing the app

When you ordered the "FEMS App Time-of-Use Tariff", you received a 16-digit license key. You can use this license key to redeem the app independently in the EMS App Center.

Find instructions on how to proceed [here](#).

After installing the "FEMS App Time-of-Use Tariff", you still need to install the corresponding app for your electricity provider. You can find this in the EMS App Center:

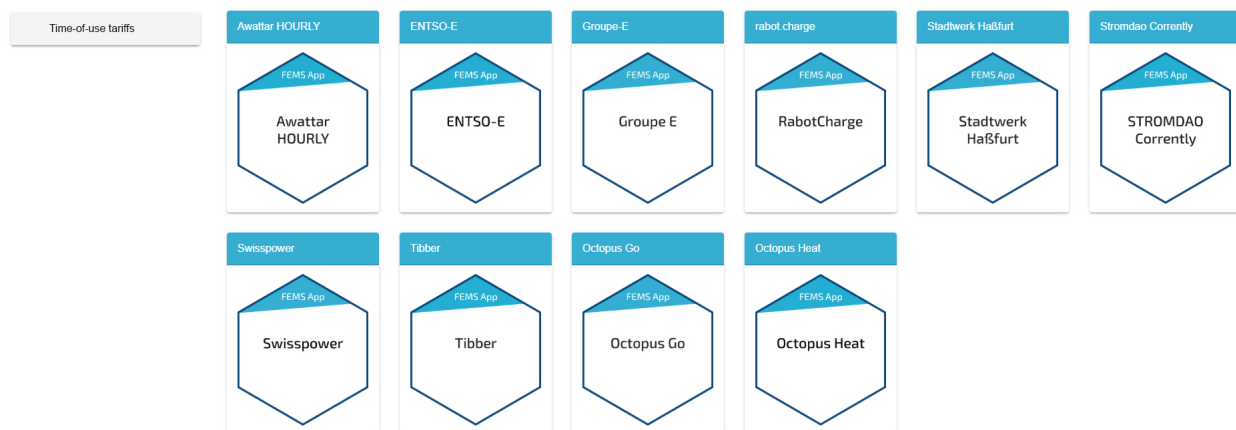


Figure 1. Selection of the appropriate tariff app

## 3. FEMS App Time-of-Use Tariff

### 3.1. Why a dynamic electricity tariff?

Previously, the rule was that the electricity price per kilowatt hour (kWh) was fixed statically for at least a whole year. However, electricity is actually traded on the exchange e. g. in 15-minute units for the next day ("day-ahead"). These 15-minute electricity exchange prices reflect the variability of an energy system based on renewable, volatile wind and solar energy. Electricity is always particularly cheap on the exchange when the sun is shining, the wind is blowing or consumption is low. The dynamic electricity tariff is therefore always closer to reality than a tariff set statically by the energy supplier<sup>1</sup>. For us as a society, this ideally results in a win-win situation: end customers can benefit from favorable prices if they can flexibly shift their grid consumption over time. Grid operators can distribute the load on the grids more evenly by using variable prices. This is another reason why the legislator is obliging all energy suppliers in Germany to offer dynamic electricity tariffs from January 2025.

<sup>\*1</sup> A favorable exchange price is not always beneficial to the grid; on the contrary, it can even lead to expensive redispatch costs. The regulatory authorities are actively working on these issues. For example, there are discussions about making grid fees variable in order to reflect the varying utilization of the grid over time.

3.2. Advantages of the "FEMS App Time-of-Use Tariff"

- *Fully-automatic operation*

After initial commissioning, the app works completely automatically and selects an optimized operating mode in each case; no parameterization of threshold value electricity prices etc. is necessary.

- *You retain your independence*

You are free to choose your electricity provider at any time. On the cut-off date, simply uninstall the previous app and install the app for your new provider free of charge.

- *One-time purchase, no recurring costs*

After the one-time purchase, there are no recurring, e. g. monthly, costs for the app — including free, lifelong updates.

- *OpenEMS Community*

The software is being developed further in cooperation with universities, institutes and other manufacturers of energy management systems in the global OpenEMS community.

- *Energy Journey*

We are already thinking about the next steps in your personal Energy Journey. That is why many further developments are being planned, e. g. price-based optimization of controllable consumer loads such as EVs and heat pumps, consideration of planned power dimming in accordance with § 14a EnWG, participation in intraday trading, compatibility for other countries and BESS products, etc.

3.3. Compatible with all energy suppliers

The "FEMS App Time-of-Use Tariff" is compatible with all energy suppliers:

- **Tibber**

- Thanks to the direct integration of the Tibber price interface, the app can use the actual end customer prices.
- During installation, you will need a personal access token for your Tibber account. You can create this at <https://developer.tibber.com/settings/access-token>.
  - Compatibility:

Country \ System	Symphon-E
Germany	✓
Netherlands	✓
Sweden	✓

### 3.3. Compatible with all energy suppliers

- [tado aWATTar HOURLY or Hourly](#)

- aWATTar was one of the first providers of a dynamic electricity tariff in Germany and Austria.
- Compatibility:

Country \ System	Symphon-E
Germany	✓
Austria	✓

- [STROMDAO Corrently](#)

- STROMDAO Corrently pursues an innovative, grid-friendly approach that uses regional electricity generation and consumption to calculate a "green electricity index". This is used for optimization in the app instead of a price per kWh.
- During installation, simply enter your zip code.
- Compatibility:

Country \ System	Symphon-E
Germany	✓

- [Octopus Go](#)

- Octopus Go offers a lower working price between 00:00 and 05:00 h, which is individual to the customer.
- When installing the app, the standard price and low price must be entered once.
- Compatibility:

Country \ System	Symphon-E
Germany	✓

- [Octopus Heat](#)

- Octopus Heat offers a low working price for 8 hours a day, customized for the customer.
- There is a higher working price for 3 hours.
- Standard, low and high prices must be entered once when installing the app.
- Compatibility:

Country \ System	Symphon-E
Germany	✓

- [Ostrom SimplyDynamic](#)

- Compatibility:

Country \ System	Symphon-E
Germany	✓



The *FEMS App Oststrom* is currently still under development. Please use ENTSO-E instead.

- [Stadtwerk Haßfurt](#)
  - In the Stadtwerks Haßfurt grid area, you can choose between "haStrom Flex with price limit" and "haStrom Flex Pro without price limit".
  - Compatibility:

Country \ System	Symphon-E
Germany	✓

- [rabot.charge](#)
  - Compatibility:

Country \ System	Symphon-E	Germany	✓
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- [Groupe E VARIO](#)
  - Compatibility:

Country \ System	Symphon-E
Switzerland	✓

- [Exchange electricity price — ENTSO-E](#)
  - Most energy suppliers currently still pass on the day-ahead prices of the electricity exchange 1-to-1 in their dynamic electricity tariffs. The energy management system receives these prices directly from the European electricity platform [ENTSO-E](#) and is therefore compatible with all energy suppliers. Please note that ancillary electricity costs (grid charges, etc.) cannot be taken into account.
  - One of the following price bidding zones can be selected during installation: Germany, Austria, Sweden (1, 2, 3 or 4) and the Netherlands
  - Compatibility:

Country \ System	Symphon-E
Germany	✓
Austria	✓
Netherlands	✓
Sweden	✓

3.4. Functionality

The "FEMS App Time-of-Use Tariff" consists of:

- 1. a specific section that is used to read in the individual dynamic electricity prices depending on the energy supplier or electricity tariff. The prices are usually made available from 2 p.m. in quarter-hourly or hourly resolution until the end of the next day.
- 2. the visualization and configuration view, the control algorithm, etc., which are uniform for all tariffs.

The control algorithm runs through the following steps:

- 1. Forecast of local generation and consumption based on historical data
- 2. Artificial intelligence links these forecasts with the dynamic electricity prices and determines an optimized energy plan. This defines an operating mode for every quarter of an hour of the available period:
  - a. **Self-consumption optimization:** The electrical energy storage system operates in normal self-consumption optimization mode. Consumer loads are supplied from the PV system and battery if possible. If this is not sufficient, the remaining energy is drawn from the grid.
  - b. **Delayed discharge:** Instead of supplying consumer loads from the battery, discharging is delayed — with the aim of reserving already stored energy for times when prices are higher.
  - c. **Release charging from the grid:** The battery is actively charging from the grid in order to use the charged energy to supply the predicted consumption during significantly more expensive times. (Only available if "Active charging from the grid" has been activated).
- 3. These steps are repeated every quarter of an hour in order to continuously adapt the energy plan to changing framework conditions (e. g. if actual generation/consumption deviates from the forecast).
- 4. In real-time control, the control algorithm always applies the mode planned for the current quarter of an hour.

3.5. Visualization and configuration in Online Monitoring

After installing the "FEMS App Time-of-Use Tariff", you will see the following widget in your live monitoring:

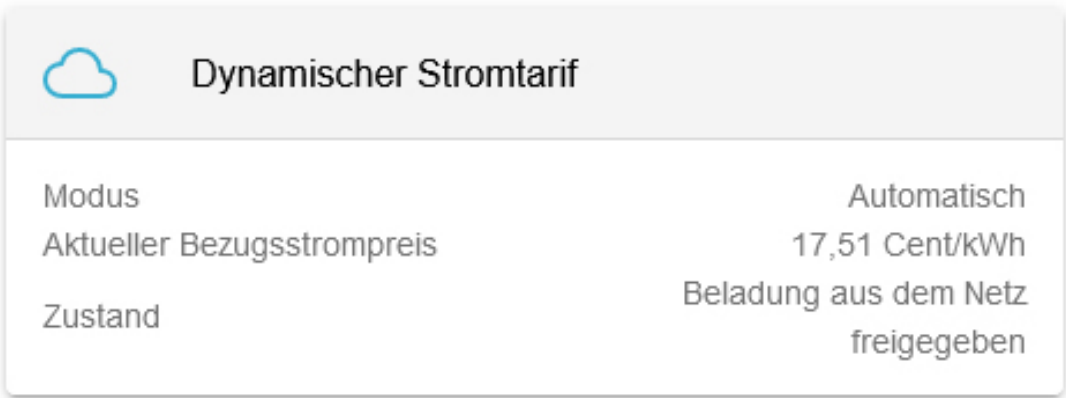


Figure 2. Live Flat Widget

Click on the widget to open the detailed and configuration view:

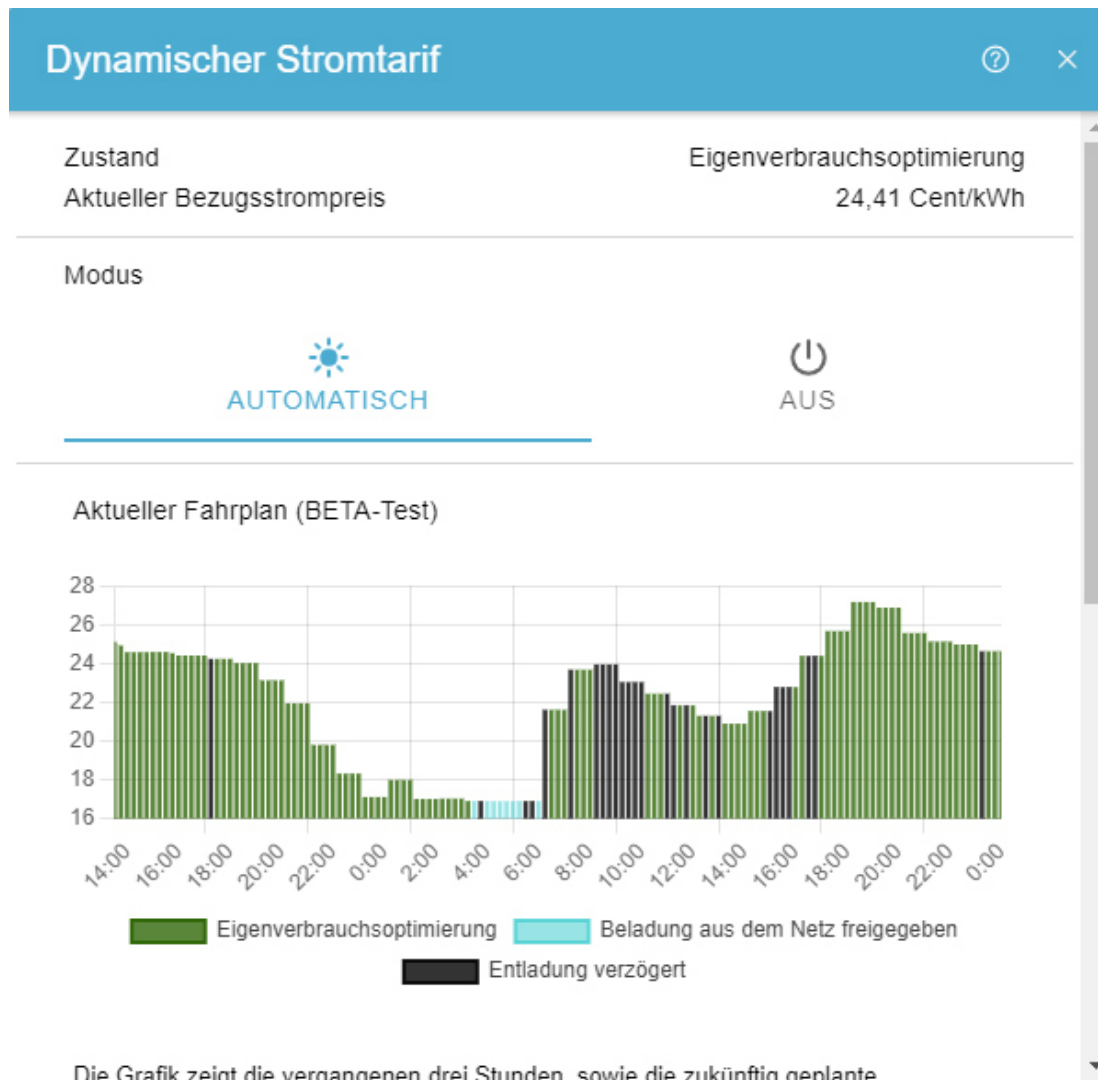


Figure 3. Live Detail Widget

Select the mode of the app here:

- OFF

This mode deactivates optimization according to a dynamic electricity tariff. Prices are still recorded, but the electrical energy storage system works permanently in self-consumption optimization.

- AUTOMATIC

This mode activates automatic optimization. Optionally, the "Active charging from the grid" function can be activated.

The [history](#) shows the recorded data for "FEMS App Time-of-Use Tariff" in the selected time period:



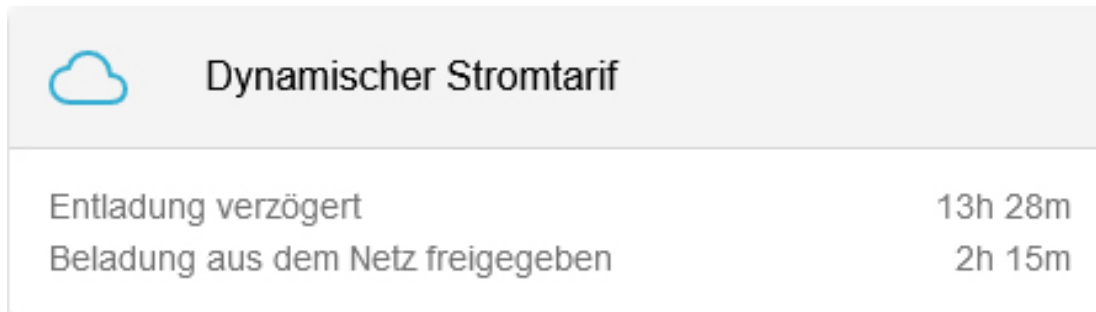


Figure 4. History Flat Widget

Clicking on the widget also opens the detailed view here. This shows:

- State of Charge

the State of Charge of the electrical energy storage as a percentage [%]

- Self-consumption optimization

Time periods in "self-consumption optimization" mode

- Discharge delayed

Time periods in "Delayed discharge" mode

- Release charging from the grid

Time periods in "Release charging from the grid" mode (only available if "Active charging from the grid" has been activated).

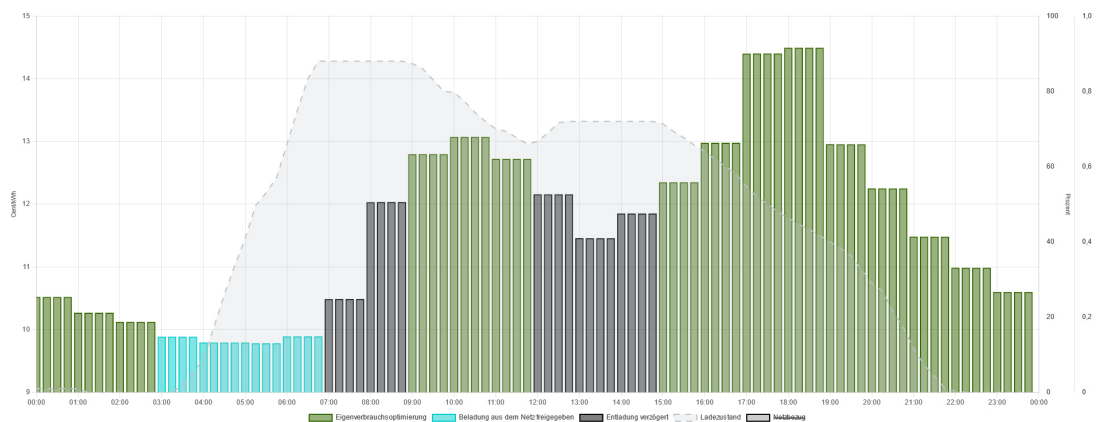


Figure 5. History detail widget

The graph shows a day with an automatic energy plan. The height of the bars shows the electricity price per quarter of an hour or hour.

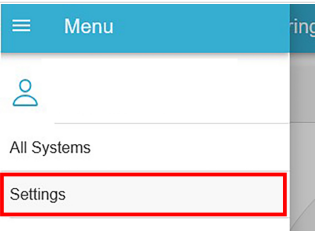
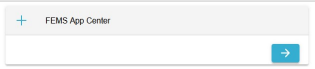
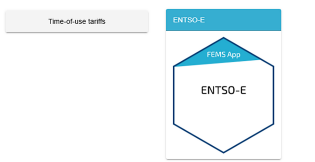
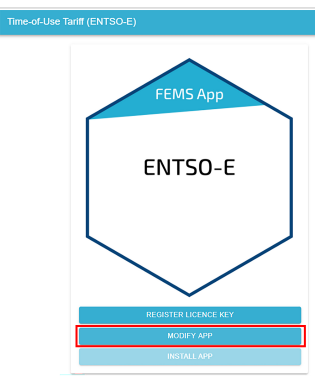
- In the morning, the battery is initially empty. From 3 a.m., the blue bars show that the battery is actively charging from the grid and the state of charge — the dashed line — is increasing.
- From 7 a.m. to 9 a.m., prices are average, so the AI decides to supply consumption from the grid during this time. The app works in "delayed discharge" mode and the state of charge remains constant.

- During the high-price phases from 9 a.m. to 12 p.m. and from 3 p.m., the electrical energy storage system supplies all consumer loads and there is no draw on the grid — until the battery is empty again in the evening.

3.6. Limiting the maximum amount of electricity drawn from the grid

To change the limit on the maximum amount of electricity drawn from the grid into the electrical energy storage system, please proceed as follows.

Using the example of ENTSO-E:

	<div>1. Click on the burger menu in the Online Monitoring.</div> <div>2. Select the "Settings" option.</div>
	<div>3. Click on the arrow of the "FEMS App Center" button.</div>
	<div>4. Scroll down to the "Time of Use Tariffs" category.</div> <div>5. Click on the "ENTSO-E" tile.</div>
	<div>6. Select "Edit app".</div>

This settings window appears:

Time-of-Use Tariff (ENTSO-E)

Alias\*

Dynamischer Stromtarif (ENTSO-E)

Bidding Zone

Germany ▾

Resolution

Hourly prices ▾

Max. grid withdrawal through battery charging

20000

Watt

UPDATE APP

UNINSTALL APP

The **Maximum grid withdrawal** can now be set here by battery charging.



The value must not be set higher than the dimensioning of the corresponding miniature circuit

breakers in the household.

### 3.7. FAQ & Troubleshooting

#### 1. *Is a permanent internet connection required?*

Yes, our storage systems also work without a permanent internet connection. However, a permanent Internet connection is absolutely necessary for the "FEMS App Time-of-Use Tariff" in order to read in the prices from the energy supplier.

#### 2. *What power is used to charge the electrical energy storage in "Release charging from the grid" mode?*

The charging power is calculated adaptively in relation to the available capacity and predicted consumption.

#### 3. *The behavior of the "FEMS App Time-of-Use Tariff" is not comprehensible or illogical.*

For various reasons, the behavior of the "FEMS App Time-of-Use Tariff" sometimes appears illogical. Since the app depends on the quality of the consumption and generation forecasts, there is always a certain inherent "fuzziness" in the behavior that can appear illogical in retrospect.

However, such behavior can usually be traced back to one of the following problems:

##### a. **Full coverage of local generation**

The consumption and generation forecast is based on local historical data. It is therefore essential that generators are recorded without any gaps. Regular substantial 'negative consumption' in the historical view is an indication of such an error.

##### b. **EV charging**

Even if the current version of "FEMS App Time-of-Use Tariff" does not yet actively control EV charging, the measurement data from compatible EV charging stations is already processed in the consumption forecast. We therefore recommend using a compatible charging station and purchasing the corresponding app.

##### c. **Time for self-programming**

The local consumption and generation forecast requires at least 24 hours for self-programming.

##### d. **Restart or system update**

After a restart or a system update, the AI algorithm needs some time to determine an optimal energy plan. During this time, the app works in "self-consumption optimization" mode.

##### e. **No charging at the lowest price**

The "FEMS App Time-of-Use Tariff" takes into account efficiency losses that occur when charging and discharging the battery from the grid. Charging is only carried out if the price difference over the course of the day justifies it.

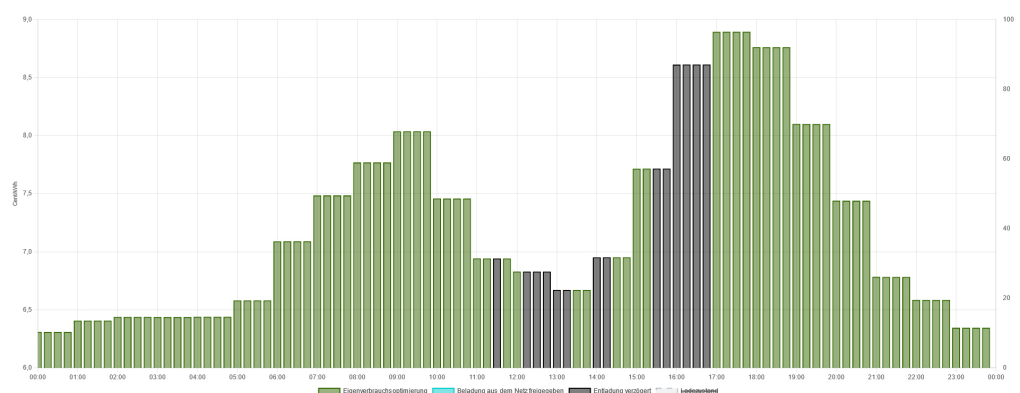


Figure 6. No charging at the lowest price

The screenshot shows a corresponding daily curve. The price peak in the afternoon can be bridged by surplus PV generation and delayed discharging. This means that only the hours with a low price in the early morning would be suitable for charging from the grid. In this case, however, the price difference is too small (approx. 6.5 cents/kWh at night and 8.0 cents/kWh in the morning), so charging is not carried out.

#### f. Fully charge electrical energy storage from the grid

For minimizing forecast errors, the app stops in "Release charging from the grid" mode when the State of Charge reaches 90 %.

### 3.8. Further information

- We develop the algorithms and connections used in the "FEMS App Time-of-Use Tariff" in cooperation with universities, institutes and other manufacturers of energy management systems in the global OpenEMS community.
  - Find more information about OpenEMS at [www.openems.io](http://www.openems.io)
  - If you are interested, please feel free to contribute to the discussion in the [OpenEMS Community](#)
- Detailed background information on exchange electricity prices can be found at [Energy-Charts.info](http://Energy-Charts.info)

#### 4. Contact

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#### 4. Contact

For support, please contact:

Symphon-E Service

Telephone service: +49 (0) 371 45 85 68 - 100

E-mail service: [symphon-e@heckert-solar.com](mailto:symphon-e@heckert-solar.com)

## 5. Directories

### 5.1. List of illustrations

Figure 1. Selection of the appropriate tariff app

Figure 2. Live Flat Widget

Figure 3. Live Detail Widget

Figure 4. History Flat Widget

Figure 5. History detail widget

Figure 6. No charging at the lowest price